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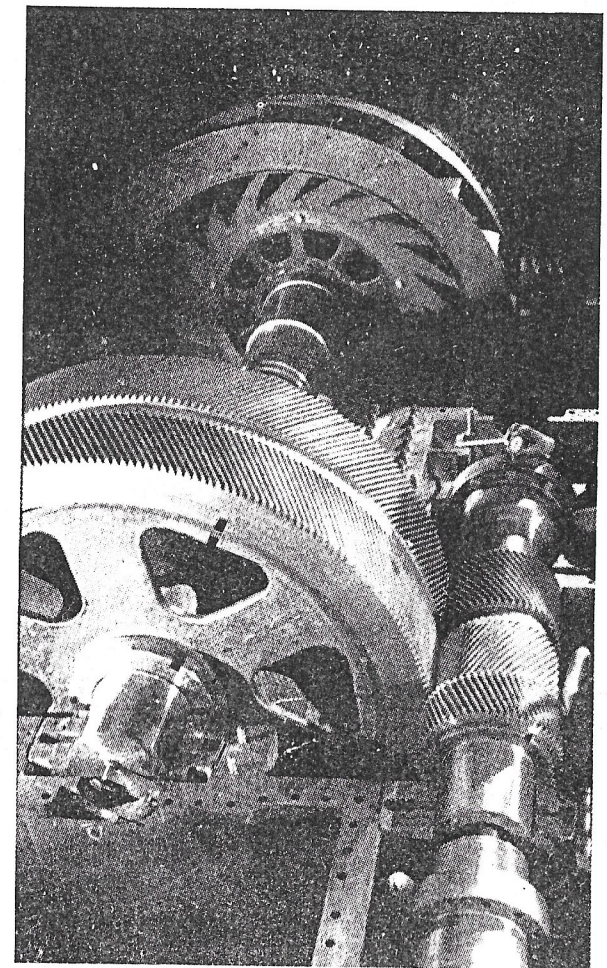
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W H E E L



Journal of the
Engineering Faculty Society
University of Southampton

One Shilling



THE WHEEL

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THE ENGINEERING FACULTY SOCIETY
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BBC

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Editorial

The Engineering Faculty Society extends a warm welcome to all freshers; we hope that their stay in Southampton will be enjoyable and be of at least three years duration.

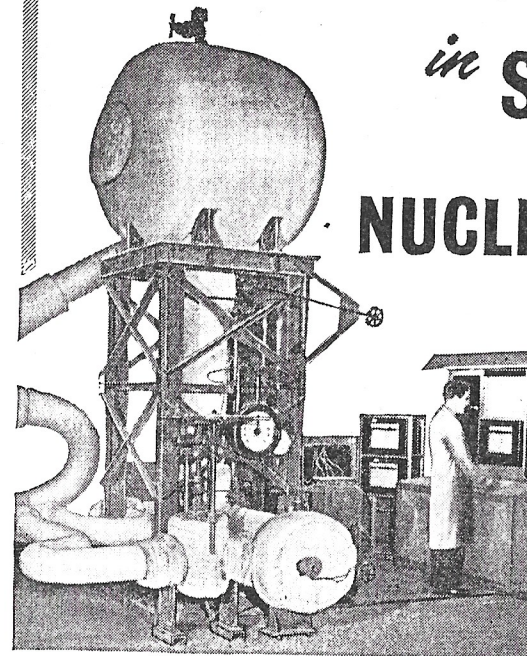
We hasten to remind the freshers, however, that while the obtaining of a University degree is the chief purpose of their stay here, the full benefit of a University education can only be obtained by merging with their studies an active participation in a few of the many student activities. It is therefore hoped that all newcomers to the Engineering Faculty will support the E. F. S., which exists primarily for the benefit and advancement of Engineers' interests, and that they will help to mould it into a society, which will best further these aims in a manner agreeable to the majority of its members, and to all other members of the Students' Union.

It is sometimes said that Engineers are specialists, engrossed in their own world with no cultural interests at all. This is not true, and it seems a great pity that those studying the humanities should attempt to make larger the gap between themselves and Scientists and Engineers, by convincing each other of our apparent disinterest in the arts, etc. One does not often hear Engineers accusing Arts students of ignorance of scientific and technological topics except in self-defence. We feel that this 'barrier' is unwanted and certainly unnecessary, and that at this University, as indeed at all others, each individual academic discipline ought to be respected in its own right, and thus lead to a better understanding of the significance by all students of both the humanities and sciences.

We take this opportunity of thanking all those members of the E. F. S. who gave up their time and energy to help prepare the 1964 Engineers' Ball; it was certainly a worthwhile effort, as a most enjoyable time was had by all who attended.

As most Engineers and members of the Union are aware the Faculty's 1929 Dennis 'Toastrack' bus is at Villalba in Spain with a broken differential. Negotiations for its return to Southampton have almost been completed, and the probable cost of recovery will be about £130. We ask everybody who would like to see the 'Rack back in Southampton to send a donation, however small, to the Treasurer of the E. F. S.

A Career with a FUTURE in STEAM and NUCLEAR POWER



RESEARCH,
DEVELOPMENT
& ENGINEERING

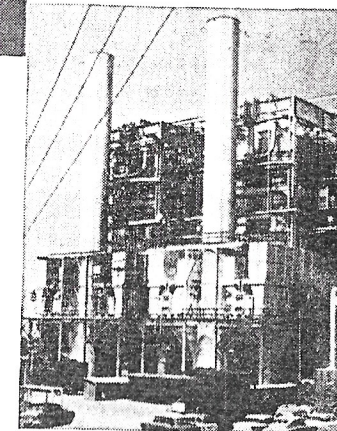
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A Revolutionary Power Unit

J. Eason Gibson

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It must be five years since observers were predicting that the gas turbine car would be with us by 1965, and it will soon be five years since the ingenious Wankel-invented rotary engine was suddenly publicised. Despite these two facts, there is little real evidence that the existing piston engine is about to be ousted from its supremacy. We have been told that the Chrysler Corporation have recently delivered a batch of their turbine cars, and that soon Rovers will be going into production with their latest prototype, the T4 saloon. Careful examination shows, however, that all Chrysler have done is to deliver, free of charge to selected clients, turbine cars for customer research, from which it is reasonable to anticipate that the opinions of these customers will sway the decisions of Chrysler considerably. The fantastic costs of research and development that must have been spent by Chrysler can certainly not be recouped unless a turbine car eventually merits full-scale production. To a lesser extent, this must be true of Rover, although they must have benefited considerably from the initial research they did in collaboration with Sir Frank Whittle.

It would, I feel, be proof of previous misconceptions if the gas-turbine car, both here and in the USA, developed into nothing more than a status symbol for the few. In view of its potential, development would now seem to be best devoted to an attempt to cheapen production, which at the moment is considerably higher than that of any equivalent piston engine. I think it likely that the first step by both Chrysler and Rover will be to offer turbine power units as alternatives in existing models, and although a sizeable extra charge must be made in such cases, the extra cost should be cancelled out by long-term reliability and freedom from overhauling problems.

Although invented by the German research engineer Felix Wankel only ten years ago, and first drawn to public attention by NSU of Germany and Curtiss-Wright in the USA, the most ingenious power unit bearing Wankel's name is now marching parallel with the much older gas turbine. These two as yet uncommercial power units will, if they do not replace the everyday reciprocating piston engine, at least serve to revitalise its evolution and subsequent improvement to an amazing extent. When the design details of the Wankel engine were first released it received a mixed reception. Some regarded it as a masterpiece of inventiveness, while other equally reputable technicians tended to dismiss it as a nine-days' wonder; but those who have studied the careful five years' programme of research have all been equally impressed.

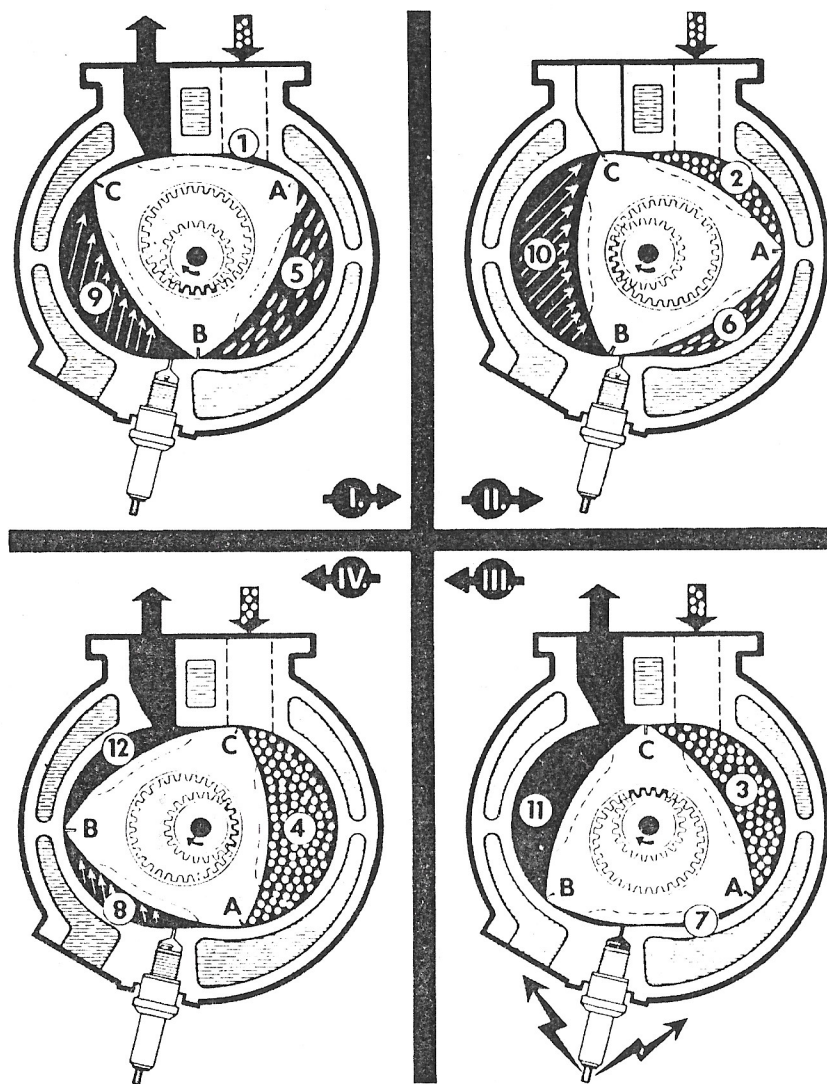
Unlike the ordinary internal combustion engine, in which the vertical movements of the piston have to be converted into rotary motion, the Wankel employs a roughly triangular rotor which turns on an eccentric shaft within a casing of dumb-bell shape. As a result, three chambers

between the casing and the faces of the rotor vary in volume, and the normal four cycles of induction, combustion, expansion and exhaust occur as in a normal four-stroke engine. In its original conception the Wankel was intended to be run at amazingly high revolutions – this intention being based on the ease of balancing the simple engine – but discretion and lessons learnt during research have shown that for the time being estimated intentions were optimistic.

The theoretical advantage of the Wankel rotary piston engine is that – unlike the normal "lifting" piston engine – no power is absorbed in stopping and restarting the piston and operating the complicated valve mechanism of the modern six-cylinder overhead-valve engine. When its lengthy development is completed the Wankel should offer reduced space requirements, less weight and complication allied with higher power output and, like the turbine, very much higher engine speeds. All but the last-mentioned feature have already been achieved. Just as it took many years for adequate piston rings to be developed for the conventional engine, it is now proving difficult to find materials and methods of sealing what can be described as the "points" of the triangular rotor. The problems have not been eased by the great divergence of size in which the new design has been built: Curtiss-Wright have built one of 32 litres, but only 700 instead of the anticipated 1,000 b.h.p. was obtained, whereas NSU experimental units have been as small as $\frac{1}{4}$ litre. The relative failure of the very large Curtiss-Wright version was thought to have been due to the fact that the vast chambers fail to promote turbulence of the gas, and further experimentation suggests that the optimum size is in the region of 400 c.c. There is, of course, no objection – theoretical or otherwise – against assembling a series of 400 c.c. basic units end to end. Mercedes-Benz, who are also experimenting with the new unit have built for test a 160-b.h.p. two-cylinder unit of 1,400 c.c., and a 3.2-litre diesel version. Mercedes-Benz have had less trouble with sealing the piston: this may have been partly due to their use of castor oil, which is notable because of its strong adhesive property at high operating temperatures.

Because of the engine's design, as can be seen from the diagram, the sparking-plug has a particularly hard time, as it never enjoys a cooling rush of fresh gas; its entire life is spent surrounded by the conditions of ignition and expansion. This problem can no doubt be solved by a greater use of transistorised ignition, as is already used on certain racing cars. At the moment the cost of manufacture, and the large number necessarily rejected during inspection, prevent transistor ignition from being commercially feasible, but advances in the accessory trade will certainly keep step with this development.

What is completely new about Felix Wankel's engine is the way in which rotary movement is used to create variable space. The attempt to eliminate the wasted effort of converting piston movement into rotary movement on the crankshaft of a normal piston engine has constantly preoccupied engineering brains; the solution offered by the Wankel power unit should not be allowed to fall by the wayside. Research and development effort should be increased, as it would seem to be in the motorists' interests for it to succeed.



1-4  5-7  8-10  11-1 

INLET COMPRESSION-IGNITION EXPANSION EXHAUST

DIAGRAM OF THE ROTARY ENGINE INVENTED BY FELIX WANKEL, A GERMAN ENGINEER. The drawings should be followed in the order indicated by the Roman numerals. The Arabic numerals indicate phases in the working cycle, as shown at the foot of the diagram

It is perhaps the small space requirement that offers the most to the motorist. It would seem that the demand almost everywhere will increase for cars built on similar lines to the Issigonis minicars, in which the space occupied by the power unit is so small. It is not impossible that, when the Wankel engine is fully developed, a mini could be built in which the engine compartment was hardly visible. It is equally probable that when this occurs the power unit will be mounted practically on the driving axle, no matter whether the car itself employs front-wheel or rear-wheel drive.

The trend today on the everyday piston-engined car is to reduce the responsibility of the driver to the mere supplying of petrol and oil; and, although not all manufacturers have succeeded to an equal extent, the necessity for greasing the chassis is in process of being reduced to a minimum. Taking the longer-term view, it seems only right that anything that will reduce, or to all reasonable limits eliminate, the necessity to adjust tappets and have valve seats refaced is a step in the right direction. These advantages the Wankel engine would certainly seem to offer.

The immense amount of work done by NSU in developing the Wankel unit will be demonstrated in practice very soon. A 500-c.c. engine producing 55 b.h.p. at 6,000 r.p.m. has been fitted into an NSU Prinz, and has already been tried out on the road.

I have just described the engine rather loosely as of 500 c.c.; but because there are three chambers German taxation experts will probably describe the engine as of 1,500 c.c.

Conversely, other authorities have suggested that, as a four-stroke engine displaces its charge of fresh gas in two crankshaft revolutions, the Wankel should be rated on the volumes of the two chambers which it displaces in two revolutions of the eccentric shaft. This would mean that the Wankel would be rated as 1,000 c.c., which seems both just and technically correct.

Even if it is still some years before either gas turbines or rotary-piston engines are in the hands of the motoring public, the likelihood of their coming – with its implications of smoother, vibrationless running, and long-term reliability and freedom from mechanical overhauls – will speed up improvement in all existing power units.

RESEARCH

When the fire sinks low
And drops the ember
Where I remember
A cavern all aglow;
Excited was I when
Fancy made me think
Myself upon the brink
Of finding treasures, only then
The cinders fell asunder
My treasures tumbled under
And I had to start again.

R.E. Steven

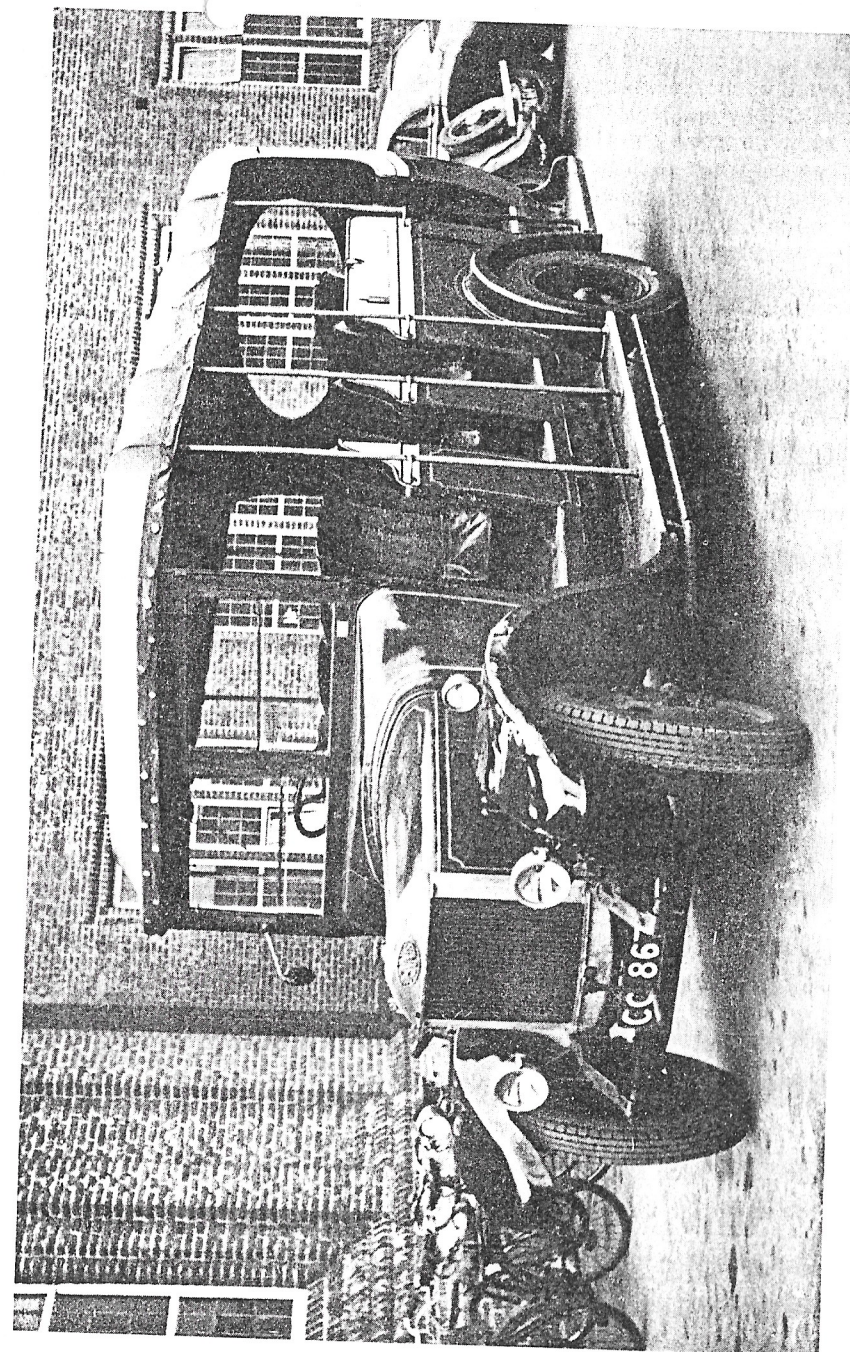
The 1964 'Toastrack' trip to Portugal

During the 1964 summer vacation, ten members of the Engineering Faculty Society took the Society's 1929 Dennis 'Toastrack' runabout on a tour of Northern Spain and Portugal. In order to relieve the monotony of travelling on the 'Rack for four weeks, it was decided to rent three flats for a week in the Portuguese holiday resort of Cascais. The tour was planned as follows:- the first week would be taken travelling to Cascais, the second week would be spent there, and the final two weeks would be taken returning to England.

The 1964 'Toastrack' trip commenced at 9.00 p.m. on Saturday 6th July with an undistinguished departure from the Union Carpark. The channel crossing between Southampton and Cherbourg was made overnight on board the new Thorensen car ferry 'Viking I'. The journey from Cherbourg to Cascais took six and a half days. Overnight stops were made at camping sites at La Rochelle, Biarritz, Burgos, Salamanca, Verda da Serra, and Lisbon. Generally speaking the country through which we travelled tended to be flat and uninteresting. Crossing the Pyrenees and the journey through Portugal were, however, notable exceptions.

During the first day's travelling, the 'Rack was stopped three times by the French Police. They insisted on shouting at us and pointing, obviously attributing our inability to understand French to deafness. We eventually decided that they were trying to tell Ollie Littlejohns, the driver of the 'Rack, that it was dangerous to drive on the left hand side of the road, especially when in France. At the camping site at La Rochelle, we sampled our first meal which had been cooked over a camp fire. After the meal, which consisted of burnt sausages and burnt potatoes, it was unanimously decided to relieve Geoff Bennett of his duties as hon. chef. The climbing of the Pyrenees provided the first real test of the 'Rack's stamina. As always, it emerged with flying colours, for only once did we have to stop to allow the radiator to let off steam. At Salamanca we met a student from Liverpool University, and as we knew some of his friends who lived in Southampton, we decided that the occasion called for a little celebration. The next few hours were spent sampling local delicacies and tasting a few of the many Spanish wines. After the evening's festivities, one member of the party who was undressing outside his tent noticed something glinting in the moonlight. After attacking it with a hammer and deciding that it was alive and in a vicious mood, he came to the conclusion that it was a grass snake. He summoned the remainder of the party from the nearby bar, and instigated a search. The only suspicious object found, was a mutilated University tie a few feet away from Robin Trowsdale's tent.

We reached the Spanish-Portuguese border about midday the following day. At the border, as at every camping site in Portugal, we were each presented with a miniature bottle of Port - a most fitting welcome!



THE 'TOASTRACK'

We arrived in Cascais at 11 o'clock on the Saturday morning. The 'Rack had stood up to the journey of 1,000 miles very well and no mechanical trouble had been experienced. We parked the 'Rack in the main street and John Gilbey and Dell Adams went off to try and contact the landlord, whose flats we were going to stay in during the next week. Half an hour later they returned with the landlord who showed us to our accommodation. Two of the flats were above a restaurant in the town centre, whilst the third was half a mile away on a hill-side overlooking the harbour. All three were very pleasantly decorated but rather small.

Cascais is a flourishing holiday resort situated ten miles from Lisbon at the western end of Portugal's Costa del Sol. Much of our time in Cascais was spent relaxing on nearby beaches. The weather was excellent and we were greeted with cloudless skies every day. We were all soon rewarded with sun-burnt skins being, unfortunately, of the red, painful variety.

On the Tuesday following our arrival in Cascais, we visited Lisbon and spent all day touring the city. If any of the readers of this article are ever fortunate enough to go to Lisbon, they must pay a visit to St. George's Castle which is situated on a hill high above the valley in which the city itself is built. From the castle one obtains a remarkable panoramic view of the city and the Tagus Estuary. At Lisbon, the Tagus will shortly be crossed by the new Tagus Suspension Bridge which, when completed will have a longer span and taller towers than the recently opened Forth Bridge.

The highlight of our stay in Portugal was undoubtedly our visit to a bullfight at Lisbon's Campo Pequeno Bullring. We arrived at the bullring an hour before the bullfight was due to begin, parked the 'Rack, and disappeared into a wine bar. We emerged three quarters of an hour later only to be accosted by an irate Portuguese police inspector. With the help of an English speaking Portuguese friend, who was accompanying us to the bullfight, we learnt that the police inspector was annoyed with us because four of his men were occupied in protecting the 'Rack from a horde of souvenir hunting Portuguese. He did, however, quickly waive his objections on payment of 50 Escudos, about 6/3d. We then made our way to the seats we had reserved for the fight; these were situated in the top gallery of the stadium and were the equivalent of the 'Gods' in an English Theatre. Bullfighting in Portugal differs from that in Spain in that the bull is usually fought by a picador on horseback. The bull chases the picador round the ring, and the picador has to manoeuvre into a position from which he sticks an arrow into the bull's shoulder. After the picador had done this four times he retires from the arena, and his place is taken by the 'moços forcados', a group of young wrestlers, who grapple with the bull until it is tired out. This manhandling of the bull is an awe-inspiring spectacle and was, we thought, the most exciting part of the evening's entertainment. After this several bullocks enter the ring and herd the bull out. The bullfight also included three contests which were fought in Spanish style, that is those in which the bull was

fought on foot with capes. There were seven contests in the programme, and these lasted about two and half hours. We all enjoyed our visit to the bullring, but being unaware of the finer points of bullfighting, we were unable to fully appreciate the fights.

After spending a very enjoyable week in Cascais, we left at midday on Sunday. The 'Rack soon encountered mechanical trouble in the form of petrol starvation. At first, we could not decide what was causing the trouble, and eventually we decided to dismantle the petrol feed system. We found nothing amiss so the system was cleaned and replaced, but still the trouble persisted. As a result we were only able to make slow progress. The trouble gradually grew worse; we again dismantled the petrol feed system and this time we found that the gasket on the 'Auto-vac' had fractured; this was quickly renewed. Our overall progress that day was slow and we covered only forty miles in seven hours. Sunday night was spent at Caldas da Rainha and Monday at Oporto.

Oporto is the second largest city in Portugal and is the port through which all Port Wine is exported. On Tuesday morning we visited the Sandeman Wine Cellars. We were taken on a very interesting tour of the cellars, and were later entertained as V.I.P's by the Chief Wine Taster. In return for displaying a Sandeman poster on the 'Rack, we were each presented with a full bottle of Port.

The next two overnight stops were made at Viana do Castelo and Corunna. On Thursday morning we had almost reached the small town of Villalba, about 45 miles from Corunna, when the 'Rack suddenly ground to a halt. Investigations revealed a slight leak of oil vapour from the differential casing. We then knew that either the differential had seized or a half-shaft had broken. We managed to have the 'Rack towed to a nearby garage where we removed the half-shafts and although both were very hot neither had fractured. The differential, or what was left of it, was removed from its casing. All the teeth on both the crown and pinion had sheared off. In England a reconditioned differential could be obtained fairly cheaply; in Spain to obtain one was impossible. The 1964 'Toastrack' trip had come to a sudden and ignominious end.

Ten bitterly disappointed Engineers spent the remainder of Thursday in Villalba. Early on Friday morning we caught a bus to Lugo, the nearest railway station. At Lugo we waited for 16 hours for the next train which was travelling in the direction of the French border. Finally, at 1.00 a.m. Saturday, we restarted our return journey to England. We were in Paris by 10.00 a.m. Sunday, and in London twelve hours later. Mike Jarman and Geoff Bennett left the party in Paris and returned to Southampton by way of Cherbourg.

Throughout the trip the weather was excellent - not once did it rain - and this coupled with the hospitality extended to us by the Portuguese and Spanish people made the holiday both worthwhile and enjoyable.

PERSONNEL

- Drivers: -** Ollie "Eh up" Littlejohns.
John "Speed" Hackworth.
Mike "No reactions" Jarman.
- Passengers: -** Dell "Sarcasm" Adams.
John "Smooth" Gilbey.
Geoff "Rubber guts" Bennett.
Richard "Hmmm..." Jenkins.
Roger "Sober" Lillicrapp.
Dave "Snorer" Moore.
Robin "Grass snakes" Trowsdale.



The Management Study Group

Maurice Byford, Chairman

The idea for forming the group came from outside the University during the summer term of 1963. Some organisation was needed during the long vacation to arrange a couple of speakers and for the election of a committee. The subject of management ties in very closely with an optional part of the B.Sc. (Economics) degree so that it is only to be expected that the main strength of the group should come from the Social Sciences Faculty. It could well have become a purely one-faculty society but several Engineers and Scientists showed interest enough to attend the first A.G.M. It was decided therefore to broaden the nature of its activities to some extent in order that people from all faculties could be included.

Six meetings were held during the 1963-64 session on a wide range of topics, the scope of each being very general. The name of the group implies a more intensive consideration of management problems than is contained in the "lecture and questions" type of meeting. It is hoped to develop this aspect of the group's activities by forming internal groups of 4 or 5, possibly less, who can take a very specific topic and pursue the study of it in detail by means of textbooks, factory tours, etc. Such study would require much extra-curricular work for people outside the Social Sciences Faculty and it is not expected that these members of the group will be very active in this field. Of course, if such members express interest in the more intensive work of the group, they will be included. However, without knowledge of the basic theoretical principals of management practice, it will require much effort to make some useful contribution.

This briefly is the essential purpose of the group, but in its wider purpose the group will be of interest to all those who expect to attain a management position sometime after leaving University, whichever faculty they may be in now. Certainly, we do not aim to work on the academic level of the new Business Schools now being set up in this country, but if we can spread a general knowledge of what management involves, we shall have provided an introduction to further studies of the subject.

It should be possible to expand the activities of the group greatly next year particularly as financial assistance is likely to be available from the Union. The local British Institute of Management have promised to help wherever possible, especially in providing good speakers and facilities for works tours followed by discussions with management. It is to be hoped that knowledge thus gained can be adapted for use in reorganising the management of the Union itself, which will become a pressing need shortly when the numbers far exceed the capacity of the present system.



THE ROYAL AERONAUTICAL SOCIETY

Man Powered Aircraft Group

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of the Southampton University Man Powered Aircraft Group, in recognition of the fact that the Group's machine was the first aircraft built and flown under the Royal Aeronautical Society rules laid down for the Kremer Competition.

The machine took off and flew under muscular power for seventy yards, attaining a maximum height of six feet, on the 9th November 1961 at Lasham Airfield, Hampshire.

Dated this seventh day of February 1964



Chairman, Man Powered Aircraft Group.

MAN POWER

The Kremer Prize of £5,000 is still on offer, to the first team to produce a man-powered aeroplane that will fly a figure-of-8 mile. A Southampton University team, powered by Professor E.J. Richards, did some hard work on a design in 1961. Good luck to any of them still in the running. Or is 'pedalling' the right word?

Associated Electrical Industries Ltd. is not immediately involved in the production of power by muscle. The reverse. AEI is dedicated to the proposition that all the world's really hard work should be done by electricity. But AEI raises its corporate hat to good young brains and is very properly interested in recruiting them into its own team. AEI welcomes approaches from graduates-to-be who are reading electrical or mechanical engineering now and are wondering about careers in the future.

The four major groups of AEI are the Industrial Group, the Power Group, the Electronics Group and the Woolwich Group which makes cables and telecommunications. The opportunities in these groups are outlined in the publication 'AEI Careers for Graduates' which is available from: Mr. R.F. Marshall, University Liaison Officer, Dept. SU, Central Personnel Services, Associated Electrical Industries Ltd., 33 Grosvenor Place, London, S.W. 1.



CAREERS FOR GRADUATES

The Channel Tunnel

Dudley R. Cloake, B.Sc. (Econ.)

The first scheme for the construction of a Channel tunnel was put forward in France in 1802, by a mining engineer named Albert Mathieu. In the years that followed, a number of schemes were put forward both for a Channel tunnel and a Channel bridge, but it was not until 1872 that a determined effort was made to sink the tunnel. A Channel Tunnel Company was chartered in England with Lord Grosvenor at its head; the tunnel envisaged by this company was to cost £10 m. and would extend from Dover to Sangatte. In the same year, a French Tunnel Company was formed to start work on the tunnel from the French side. Both companies were severely handicapped by a lack of foreknowledge of the geological structure of the Channel bed, however they believed, and this was later confirmed by surveys, that the Lower Chalk Beds stretched without interruption under the Straits of Dover, a geological situation highly favourable to the construction of a tunnel. Unfortunately, after paying for surveys of the bed of the Channel, Grosvenor's Company went bankrupt and it was a company under Sir Edward Nathin that took the first positive steps towards actually constructing a tunnel from the English coast. In 1880, he sank a 74ft. shaft near Dover and began driving a horizontal pilot gallery into the Lower Chalk Beds. Tunneling then began in earnest, a second shaft was sunk and a pilot tunnel was started that was intended to join up with a French pilot tunnel. The continuous pilot tunnel was to have been enlarged by special cutting machinery and lined with concrete. Despite Nathin's considerable flair for public relations – he encouraged visitors to see the tunnel workings, and it became extremely fashionable to sip sherry with Sir Edward in his damp tunnel – it soon became evident that the Establishment was growing uneasy about the project. Fears of a strategic nature were voiced and cartoonists of the day pictured a second Napoleon riding through the tunnel at the head of a huge invading army. Eventually Public opinion turned against the tunnel project and work stopped in 1884 with 1¼ miles of pilot tunnel completed from the English side.

During the first half of this century the Channel tunnel project remained in a dormant state. By the 1950s, however, it had become obvious that Britain's strategic position had been vastly altered by the advent of nuclear armaments, and her political and economic position altered by a withering away of her empire, and a technological revolution that had increased her trade with the industrialised continental nations. Moreover, the traditional British sense of insularity was seen to have been eroded by a kind of rootlessness arising from our altered position in the world and the intrusion of such unisular influences as television, increasing foreign travel and the jet aeroplane. In 1957, public and parliamentary opinion was judged to be sufficiently pro-tunnel, and in July of that year the four main interests connected with the tunnel, the English and French

Tunnel Companies, the Suez Canal Company and the Technical Studies Corporation of New York, combined to create a new organisation known as the Channel Tunnel Study Group. This group proceeded to carry out a complete geological survey of the Channel bed, and also a survey of the economic and engineering problems involved in the creation and operation of a Channel tunnel. On the basis of these surveys the group proposed that a single international company be established by a Franco-British Treaty; that the cost of the tunnel should be raised from private sources of finance on the international money markets of the world; and that the operation of the tunnel should be the joint-responsibility of the British and French railway organizations, on a long-term lease from the Tunnel Company for which a rental would be paid, sufficient to provide a reasonable return on the capital invested in the tunnel.

The group recommended emphatically the construction of a rail tunnel, although they suggested it could either be bored through the chalk which would take an estimated six years, or consist of an immersed pre-fabricated tube laid in a trench dredged in the sea bed, a project which, it was estimated, could be completed in four years. The reason a rail tunnel was chosen in preference to a road tunnel, or even a bridge, was purely one of economics. A road tunnel would give rise to ventilation problems which could only be solved at high cost; while a bridge, it was estimated, would cost £260 m. (this was in 1957) as opposed to an estimate of £130 m. for a rail tunnel, yet it would bring no higher revenue to compensate for the heavier capital cost. So it was decided by the Group that only a railway tunnel would provide a viable proposition for which private capital would be attracted by the prospect of a reasonable rate of profit.

The tunnel, it was proposed, would consist of two single tubes, made self-ventilating by the piston effect of train movement through them. The tracks would be equipped for electric traction with poly-current locomotives for through working. The Study Group envisaged a shuttle-service for motor vehicles through the tunnel, on specially constructed rolling-stock. The length between the termini of the proposed tunnel would be about 42 miles and this distance would be covered in 45 minutes allowing for loading and unloading of vehicles at either end. The Group saw the possibility of twelve car-carrying trains an hour at peak periods, plus three through trains. The through trains would complete the London to Paris run in 4½ hours, and would thus be highly competitive with existing air services between the two cities. Although many critics have disputed this fact, the Study Group claimed on the basis of their own traffic projections, that this tunnel would have a capacity large enough to carry peak loads of three times the level estimated in 1984. So there seems no danger of the tunnel becoming out of date within the foreseeable future.

The Study Group went further in recommending actual tariffs for traffics passing through the tunnel. They envisaged an optimum tariff for an average-sized car of £7. 16. 0. for a single journey through the tunnel, which was in 1957 30% less than the tariff for an average-sized car on the best-competing sea route. The tariff for a single crossing on the

Lydd- Le Touquet air route was, for an average case, about £10 in 1957. The optimum toll for a passenger was set at 32/- single which was 5% less than the average single fare for the sea crossing in 1957. It seems more than likely, therefore, that the cost advantage of the Channel tunnel will lead to a considerable diversion of traffic from existing cross-Channel facilities when the tunnel comes into existence. In fact British Railways have already stated that they will cut their cross-Channel services from Folkestone and Dover when the tunnel comes into operation.

In September 1963, a report was presented to the British and French Ministries of Transport. In it were proposals for a fixed Channel link which supported to a very substantial degree the report of the Channel Tunnel Study Group. This was followed in February of this year by a momentous announcement by Minister of Transport Marples in the House of Commons. He stated quite simply that the French and British Governments considered the construction of a Channel tunnel a worthwhile investment for their two countries. So 160 years after the first proposal we are to have a Channel tunnel, and although it will be a tunnel of the type recommended by the Study Group, the British Government has made it quite clear that equity capital would have no place in its financing, as ultimate ownership and control of the project must rest with the British and French Governments.

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Faculty Notes

Officers elected to serve the E.F.S. for the 1964-65 session.

President	R. E. Steven, B.Sc., Ph.D., A.M.I.E.E.
Chairman	Brian Hemsworth
Madam Vice-Chairman	Judith Scott
Secretary	Reg Williams
Treasurer	Dave Fenn
Equipment Officer	Gordon Davies
Editor of the 'Wheel'	Robin Trowsdale
Toastrack-keeper	Martin Saunders
Organiser of the Ball	John Houlton

Belated congratulations to Stu Humby on his election as President of the Union. We hope that he will find his year of office an enjoyable and rewarding experience.

Roger Lombard, who served on last year's E.F.S. committee as Fresher's Rep., is now engaged on a four year course in Automobile Engineering at Loughborough College of Technology.

Ideas for the theme of next year's Engineers' Ball and next year's Rag Float will be welcomed by the committee.

Although very disappointed that we ourselves did not win the 'Antlers', we congratulate the Chemical Society on winning this year's Rag Float competition.

Trips organised by the E.F.S. committee are as follows:-

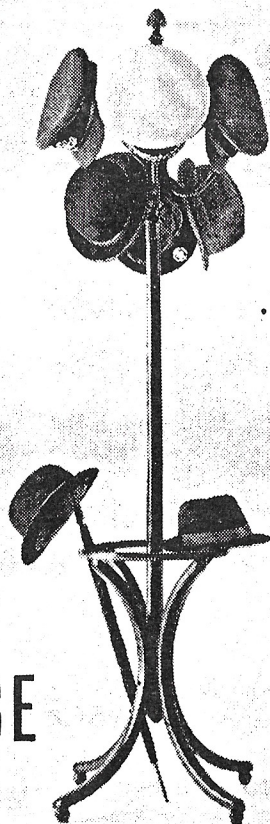
- 10th February 1965: Southern Evening Echo printing works in Above Bar, Southampton.
- 24th February 1965: Esso Oil Refinery at Fawley.
- 10th March 1965: M.I.R.A. research station at Nuneaton.

There will also be a visit to Baddesley Colliery, Atherstone, Staffordshire, sometime next term.

If there is anybody who is interested in representing the E.F.S. at football on Sunday afternoons, will they please contact Robin Trowsdale. Preference will be given to players who do not play for a University team on Saturdays.

If anyone thinks he can design a more suitable cover for the 'Wheel' will he please contact the Editor.

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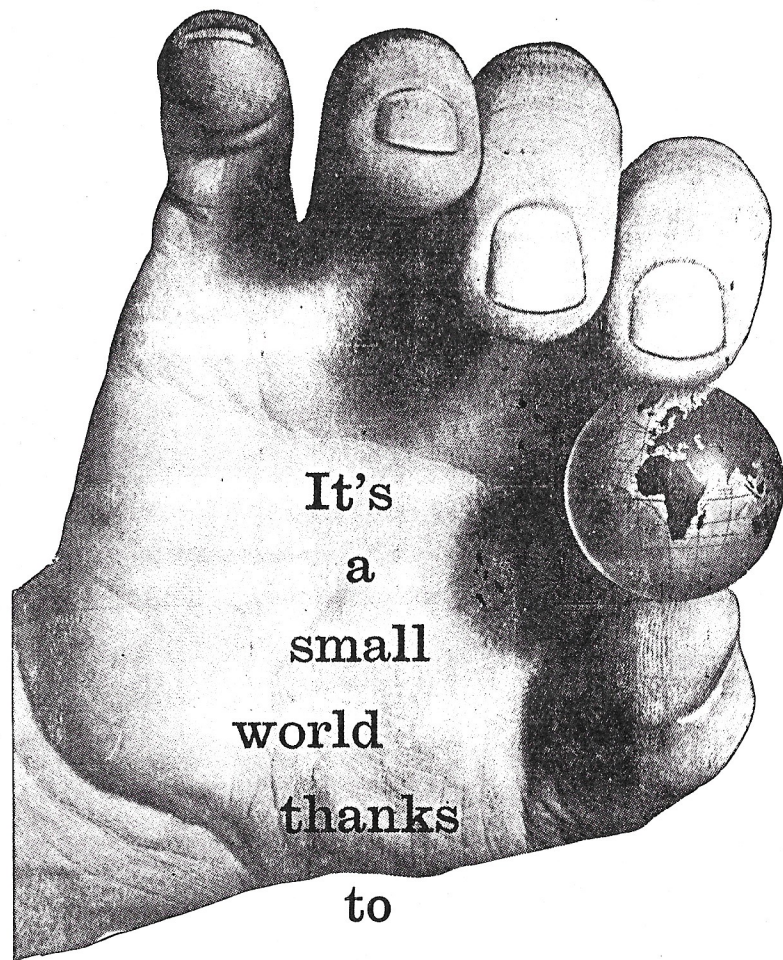
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